

## © PAJ / JPO

- PN - JP10107671 A 19980424
- TI - ANTENNA FOR PORTABLE RADIO TERMINAL
- AB - PROBLEM TO BE SOLVED: To maintain satisfactory antenna characteristics in both frequency bands that are mutually separated by inserting and serially connecting variable capacity diode and its bias current supply circuit and changing a serial capacity value to resonate a plurality of different frequency bands.
- SOLUTION: Variable capacity diode and its bias control circuit are serially connected between a feeding point (a) and a feeding cable 6 to a receiver input. A radiation flat plate 1, a ground flat plate 2 and a short-circuit pin 4 are the base structure of this antenna, and the point (a) is connected to the receiver input through a feeding pin 7, a serial variable capacity circuit 5 which changes an antenna tuning frequency and the cable 6. The position of the antenna feeding point (a) of the plate 1 is defined at a prescribed position by the capacity value of a used variable capacity diode. Thereby, it can be controlled so that it can resonate in different several frequency bands. Therefore, even a radio channel that is far can maintain enough antenna characteristics.
- I - H04B1/18 ;H01Q1/24 ;H01Q13/08 ;H04Q1/50
- PA - KOKUSAI ELECTRIC CO LTD
- IN - ONISHI NAOKI SASAKI KANEMI
- ABD - 19980731
- ABV - 199809
- AP - JP19960273939 19960926

**\* NOTICES \***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**TECHNICAL PROBLEM**

---

[Problem(s) to be Solved by the Invention] Although it is rare to spoil an antenna property if additional allocation of a radio channel is the frequency band which followed the frequency band present in use, and wide band-ization of an antenna is realized, when assigned to the frequency band left sharply, only by wide band-ization of an antenna, antenna gain deteriorates and there is a problem that a good antenna property cannot be acquired. Moreover, when a mismatching loss (mismatch loss) was produced without obtaining a good impedance characteristic even when not performing wide band-ization of an antenna and antenna gain was spoiled, it was.

[0005] The purpose of this invention is in the narrow-band antenna for walkie-talkie terminals which is the trouble of the above-mentioned conventional technology to offer the antenna for walkie-talkie terminals which can give an antenna property with good either of the frequency band left mutually.

---

[Translation done.]

**\* NOTICES \***

**Japan Patent Office is not responsible for any damages caused by the use of this translation.**

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**EFFECT OF THE INVENTION**

---

[Effect of the Invention] Like the above explanation, the following effects are acquired by carrying out this invention.

**\*\* Since it is controllable to resonate by two or more different frequency bands, antenna property sufficient also by the left radio channel can be maintained.**

**\*\* A very [ in efficiency ] wide band antenna is realizable.**

**\*\* A radio channel can use also by the system assigned to two or more greatly distant bands, without changing the configuration of the end machine of the non-end of line.**

---

[Translation done.]

**\* NOTICES \***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**PRIOR ART**

---

[Description of the Prior Art] Drawing 8 is the perspective diagram showing the outline of the built-in antenna currently used for the conventional walkie-talkie terminal, and drawing 9 is the example view of a reflection property. For a radiation plate and 2, in drawing, a grounding plate and 3 are [ 1 / a short circuit pin and a of an electric supply cable and 4 ] the feeding points. Conventionally a low profile flat antenna as shown in drawing 8 is used, and resonance frequency bandwidth (ratio band) is about several % used as -10dB or less with which return loss is satisfied of voltage standing wave ratio (V. S.W.R.) <2.0 predetermined.

[0003] Drawing 7 is the example view of allocation of a frequency band. In recent years, a walkie-talkie terminal has come to spread quickly with expansion of service areas, such as a cellular phone, low-pricing of a terminal, and reduction of telephone call cost. The radio channel may have come to be assigned to the frequency band C which required radio channels ran short, for example, was left with the band A present in use like the A bands of drawing 7 , and C band in connection with it.

---

[Translation done.]

**\* NOTICES \***

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

**DESCRIPTION OF DRAWINGS**

---

**[Brief Description of the Drawings]**

**[Drawing 1]** It is structural drawing showing the 1st example of this invention.

**[Drawing 2]** It is the circuit diagram of the 1st example of this invention.

**[Drawing 3]** It is an example view of a property explaining an operation of this invention.

**[Drawing 4]** It is structural drawing showing the 2nd example of this invention.

**[Drawing 5]** It is the circuit diagram of the 2nd example of this invention.

**[Drawing 6]** They are other example views of a circuit of the 2nd example of this invention.

**[Drawing 7]** It is the example view of allocation of a frequency band.

**[Drawing 8]** It is the conventional example view of antenna structure.

**[Drawing 9]** It is the conventional example view of a property.

**[Description of Notations]**

1 Radiation Plate

2 Grounding Plate

3 Electric Supply Cable

4 Short Circuit Pin

5 In-series Variable-Capacity Circuit

6 Electric Supply Cable

7 Electric Supply Pin

8 Conductor -- Pin

---

[Translation done.]

## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the antenna which added the circuit to which antenna tuning frequency is changed especially about the antenna carried in a walkie-talkie terminal.

[0002]

[Description of the Prior Art] Drawing 8 is the perspective diagram showing the outline of the built-in antenna currently used for the conventional walkie-talkie terminal, and drawing 9 is the example view of a reflection property. For a radiation plate and 2, in drawing, a grounding plate and 3 are [ 1 / a short circuit pin and a of an electric supply cable and 4 ] the feeding points. Conventionally a low profile flat antenna as shown in drawing 8 is used, and resonance frequency bandwidth (ratio band) is about several % used as -10dB or less with which return loss is satisfied of voltage standing wave ratio (V. S.W.R.) <2.0 predetermined.

[0003] Drawing 7 is the example view of allocation of a frequency band. In recent years, a walkie-talkie terminal has come to spread quickly with expansion of service areas, such as a cellular phone, low-pricing of a terminal, and reduction of telephone call cost. The radio channel may have come to be assigned to the frequency band C which required radio channels ran short, for example, was left with the band A present in use like A band of drawing 7 , and C band in connection with it.

[0004]

[Problem(s) to be Solved by the Invention] Although it is rare to spoil an antenna property if additional allocation of a radio channel is the frequency band which followed the frequency band present in use, and wide band-ization of an antenna is realized, when assigned to the frequency band left sharply, only by wide band-ization of an antenna, antenna gain deteriorates and there is a problem that a good antenna property cannot be acquired. Moreover, when a mismatching loss (mismatch loss) was produced without obtaining a good impedance characteristic even when not performing wide band-ization of an antenna and antenna gain was spoiled, it was.

[0005] The purpose of this invention is in the narrow-band antenna for walkie-talkie terminals which is the trouble of the above-mentioned conventional technology to offer the antenna for walkie-talkie terminals which can give an antenna property with good either of the frequency band left mutually.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention is characterized by constituting so that it may resonate by two or more different frequency bands by making insertion connection of variable capacitance diode and its bias-current supply circuit (bias control circuit) in series, and changing a series-capacitance value between the feeding point of the flat antenna for walkie-talkie terminals, and an electric supply cable, or between the open end section and grounding.

[0007]

[Embodiments of the Invention] Hereafter, the example of this invention is explained with reference to a drawing. Drawing 1 is structural drawing showing the 1st example of this invention, and is the perspective diagram of the antenna for walkie-talkie terminals which connected the bias control circuit with variable capacitance diode in series between the feeding point a and the electric supply cable 6 to a receiver input. The grounding plates 2, such as the radiation plate 1 and a substrate, and

the short circuit pin 4 are considered as the basic composition of an antenna, and the feeding point a is connected to the receiver input by the electric supply pin 7, the in-series variable-capacity circuit 5 to which antenna tuning frequency is changed, and the electric supply cable 6.

[0008] Drawing 2 shows the example of circuitry of the antenna of this invention. By impressing a control voltage  $V_{cont}$  to variable-capacitance-diode CR1, electrostatic capacity value is changed and it is the resonance frequency  $f_0$  of an antenna. It is constituted so that it can control arbitrarily. However, in the built-in antenna of the usual end machine of the non-end of line, although the electric merit D of the radiation plate 1 ( $=W+L$ ) is set as about  $1/4$  of the wavelength  $\lambda$  of desired frequency, since adjustment is taken with capacity, a walkie-talkie input-side impedance and an antenna impedance are resonated on frequency higher than desired frequency at this example. That is, the antenna electrical-and-electric-equipment length D is set up shorter than the quadrant of wavelength  $\lambda$ .

[0009] Moreover, the position of the antenna feeding point a of the radiation plate 1 is set to a position by the capacity value of variable-capacitance-diode CR1 to be used.

[0010] Drawing 3 is the example of a reflection property which saw the antenna circuit when controlling the capacity value of variable-capacitance-diode CR1, and changing it, and a vertical axis shows return loss. With the curve A which a control voltage  $V_{cont}$  is high and is resonating on low frequency in the curve D which is resonating on the highest frequency, a control voltage  $V_{cont}$  is low. In this example, only the 0.68pF of the whole capacity value was changed by variable-capacitance-diode CR1 and the capacitor C1. It turns out that the resonance characteristic changes like curvilinear A-D by this, and about 100MHz of resonance frequency is changing. In practice, since there should just be about dozens of MHz variation, 100MHz can be called sufficient variation. Moreover, since it considers as high resistance (kohms) since a circuit side is not affected, and the capacitor C2 is formed as a RF path capacitor, bias resistance R1 is large capacity value.

[0011] Next, the 2nd example of this invention is explained. Drawing 4 is the perspective diagram showing the 2nd example of this invention. 8 -- a conductor -- it is a pin and other signs are the same as drawing 1. The in-series variable-capacity circuit 5 where the electric supply cable 3 from a receiver input is connected to the feeding point a of the radiation plate 1, and this 2nd example contains variable capacitance diode and its bias control circuit between the open end of the radiation plate 1 and grounding is arranged. The example of circuitry of the antenna of drawing 4 is shown in drawing 5 and drawing 6. It is controllable by all making a suitable value the value of a control voltage  $V_{cont}$ , variable-capacitance-diode CR1, and the variable-capacity adjustment capacitor C1 to resonate on arbitrary frequency which is different as shown in drawing 3. In addition, R1 is high resistance and C2 is a mass capacitor.

[0012] Drawing 5 is the example of a circuit to which it was made to change the resonance frequency in the 2nd example of drawing 4 by changing the addition capacity value of variable-capacitance-diode CR1 linked to the open end side of the radiation plate 1 (antenna element). The addition capacity value seen from the antenna side is given as in-series composition capacity value of variable-capacitance-diode CR1 and the adjustment capacitor C1. Since the capacity value of variable-capacitance-diode CR1 changes with the value of positive bias voltage  $V_{cont}$  given through the high resistance R1, the addition capacity value of an antenna changes and the resonance frequency of an antenna changes.

[0013] Drawing 6 is other examples of a circuit of drawing 5, and carries out arrangement of the adjustment capacitor C1 of drawing 5, and variable-capacitance-diode CR1 reversely. The principle of operation is the same as that of drawing 6.

[0014]

[Effect of the Invention] Like the above explanation, the following effects are acquired by carrying out this invention.

- \*\* Since it is controllable to resonate by two or more different frequency bands, antenna property sufficient also by the left radio channel can be maintained.
- \*\* A very [ in efficiency ] wide band antenna is realizable.
- \*\* A radio channel can use also by the system assigned to two or more greatly distant bands, without changing the configuration of the end machine of the non-end of line.

## \* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

## [Claim(s)]

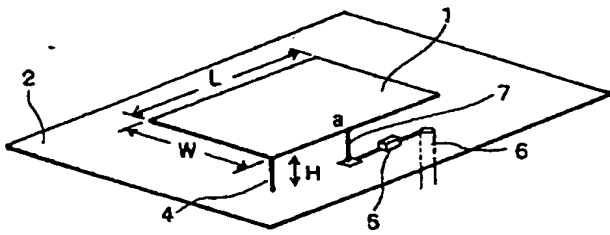
[Claim 1] The short circuit pin which short-circuits a grounding plate, the radiation plate which countered this grounding plate and has been arranged in parallel, and one end part and aforementioned grounding plate of this radiation plate, In the antenna for walkie-talkie terminals of the plane which consisted of electric supply cables connected to the feeding point of the position of the side edge section of the aforementioned radiation plate The variable capacitance diode connected in series between the feeding point of the aforementioned radiation plate, and the aforementioned electric supply cable, The antenna for walkie-talkie terminals characterized by constituting so that it can align by two or more frequency bands which the bias-current supply circuit of this variable capacitance diode is prepared, and antenna resonance frequency is changed by controlling this bias current, and are different.

[Claim 2] The short circuit pin which short-circuits a grounding plate, the radiation plate which countered this grounding plate and has been arranged in parallel, and one end part and aforementioned grounding plate of this radiation plate, In the antenna for walkie-talkie terminals of the plane which consisted of electric supply cables connected to the feeding point of the position of the side edge section of the aforementioned radiation plate The variable capacitance diode connected in series between the open end section of another side of the aforementioned radiation plate, and the aforementioned grounding plate, The antenna for walkie-talkie terminals characterized by constituting so that it can align by two or more frequency bands which the bias-current supply circuit of this variable capacitance diode is prepared, and antenna resonance frequency is changed by controlling this bias current, and are different.

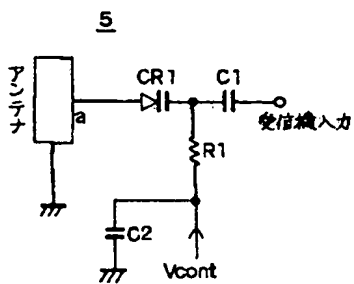
---

[Translation done.]

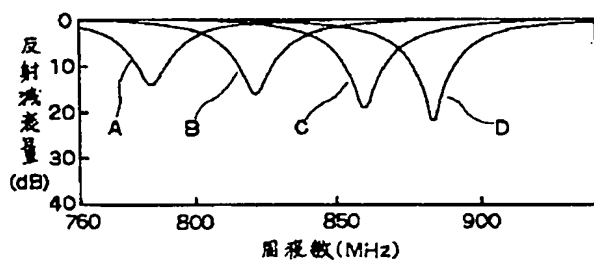


Drawing selection drawing 1

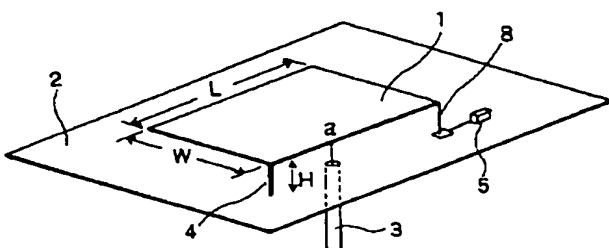
Sivu 1/1

Drawing selection drawing 2

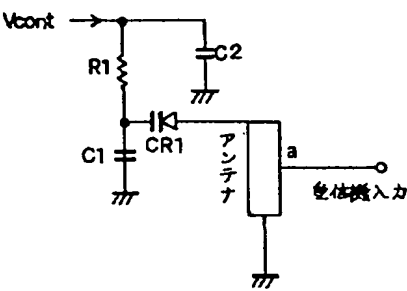
Sivu 1/1

Drawing selection drawing 3

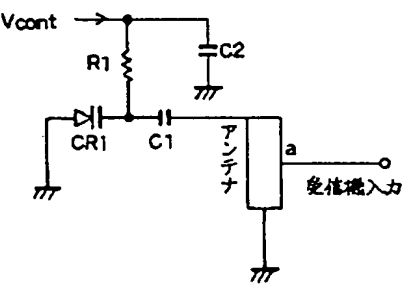
Sivu 1/1

Drawing selection drawing 4

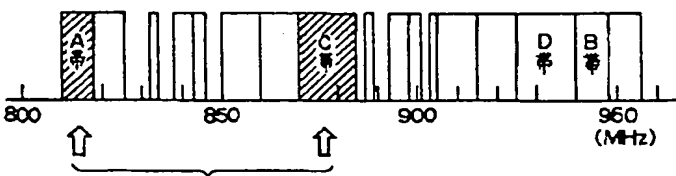
Drawing selection drawing 5



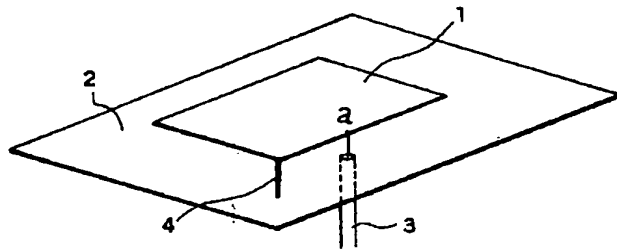
Drawing selection drawing 6



Drawing selection drawing 7



Drawing selection drawing 8



Drawing selection drawing 9

